



SEQUENCE LISTING

<110> DRUILHE, Pierre  
GRUNER, Anne-Charlotte

<120> PLASMODIUM FALCIPARUM ANTIGENS AND VACCINE AND DIAGNOSTIC USES THEREOF

<130> 000466-0035

<140> 10/712533

<141> 2003-11-14

<150> CA 2,345,206

<151> 2001-05-16

<150> CA 2,346,968

<151> 2001-05-23

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<170> PatentIn version 3.1

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Asp Asn Gln Ser Asn Val Leu Asn Arg Glu Asp Pro Ile Ala Ser Glu  
35 40 45

Thr Glu Val Val Ser Glu Pro Glu Asp Ser Ser Arg Ile Met Thr Thr  
50 55 60

Glu Val Pro Ser Thr Thr Val Lys Pro Pro Asp Glu Lys Arg Ser Glu  
65 70 75 80

Glu Val Gly Glu Lys Glu Ala Lys Glu Ile Lys Val Glu Pro Val Val  
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Asp	Trp	Ile	Asn	Gln	Ile	Phe	Lys	Lys	Asn	Ser	Leu	Gln	Cys	Asp	Leu	
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Tyr	Phe	Leu	Asp	Asp	Asn	Lys	Glu	Lys	Asp	Val	Ser	Lys	Lys	Arg	Lys	
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tcc gat ata aaa agt gaa gat gaa tat ata gaa cca tat gaa aaa aag Ser Asp Ile Lys Ser Glu Asp Glu Tyr Ile Glu Pro Tyr Glu Lys Lys 210 215 220	672
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att agg aat gaa aaa ata gaa aat aat aat aag aat gaa aaa tta ata	1248
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aaa tca tat cct aca caa tca aaa aat gtt atg agt aca ttt tcc ttt	1296
Lys Ser Tyr Pro Thr Gln Ser Lys Asn Val Met Ser Thr Phe Ser Phe	
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tgg aat att gaa aag gag aca ttt ata aca aaa cct ttg tat gca caa	1344
Trp Asn Ile Glu Lys Glu Thr Phe Ile Thr Lys Pro Leu Tyr Ala Gln	
435 440 445	

aat ttg aga aaa aaa caa ttt agt tta tta gat gaa tct gaa gag atg	1392
Asn Leu Arg Lys Lys Gln Phe Ser Leu Leu Asp Glu Ser Glu Glu Met	
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Tyr Phe Leu Asp Asp Asn Lys Glu Lys Asp Val Ser Lys Lys Arg Lys
35 40 45

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50 55 60

Ile Asn Asn Ser Lys Lys Ile Lys Asn Glu Leu Ser Ile Lys Asp Asn  
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Met His Asp Tyr Ile Tyr Asp Asp Arg Ile Tyr Asn Asn Asp Lys Glu  
85 90 95

Lys Asn Val Ile Lys Ser Asp Asn Lys Asn Val Ile Lys Ser Asp Asn  
100 105 110

Lys Asn Asp Tyr Lys Lys Cys Asn Lys Asn Val Ile Lys Ser Asp Asn  
115 120 125

Lys Asn Val Ile Lys Ser Asp Asn Lys Asn Val Ile Lys Ser Asp Asn  
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Lys Asn Val Ile Lys Ser Asp Tyr Lys Ser Asp Asp Arg Asn Ala Cys  
145 150 155 160

Asp Ile Tyr Lys Ser Asn Lys Lys Asn Val Pro Asp Asn Cys His Ile  
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Tyr Asp Asp Asn Ser Ser Val Glu Asn Leu Asp Gly Lys Asn Lys Leu  
180 185 190

Asn Asn Ile Arg Asn Ile His Asn Asp Asn Ser Ser Ser Cys Asp Ile  
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Ser Asp Ile Lys Ser Glu Asp Glu Tyr Ile Glu Pro Tyr Glu Lys Lys  
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Asn Glu Glu Asn Ile Asn Glu Tyr Lys Asn Lys Lys Asn Ile Ala Asn  
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Glu Asn Ile Lys Glu Gly Lys Ser Ser Ile Tyr Asn Asp Glu His Asn  
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Tyr Asn Ser Leu Leu Tyr Asn Ser Cys Asn Gly Glu Ile Ser Lys Ile  
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Asn Lys Ile Ser Ser His Asn Asn Ile Asp Asn Asn Met Asp Asn Tyr  
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Asn Thr Phe Ala Asn Val Asn Asn Phe Ile Ile Tyr Ser Ser Asp Asp



290

295

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Glu Asp Asn Ile Ser Asn Tyr Tyr Asn Gly Lys Asp Val Leu Asn Asp  
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Glu Ile Met Phe Pro Ile Lys Phe Asn Phe Glu Lys Leu Lys Lys Asn  
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Ile Tyr Val Ile Glu His Ile Asp Lys Ile Tyr Tyr Asp Thr Phe Leu  
 340 345 350

Asn Lys Asn Pro Ser Glu Lys Ser Val Phe Met Asn Asp Glu Ser Thr  
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Gly Tyr Leu Lys Asn Asp Val Asn Asp Lys Cys Val Val Asp Asn Ile  
 370 375 380

Asn Val Ile Asn Pro Ser Ser Val Asn Thr Leu Ser Asn Ile Ser Asn  
 385 390 395 400

Ile Arg Asn Glu Lys Ile Glu Asn Asn Asn Lys Asn Glu Lys Leu Ile  
 405 410 415

Lys Ser Tyr Pro Thr Gln Ser Lys Asn Val Met Ser Thr Phe Ser Phe  
 420 425 430

Trp Asn Ile Glu Lys Glu Thr Phe Ile Thr Lys Pro Leu Tyr Ala Gln  
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Asn Leu Arg Lys Lys Gln Phe Ser Leu Leu Asp Glu Ser Glu Glu Met  
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Ile Arg Asn Tyr Ser Ser Asn Gln Tyr Ser Ile Lys Phe Val Pro Arg  
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Pro Leu Tyr Arg Lys Gln Leu Phe Phe Arg Tyr  
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Tyr	Val	Val	Leu	Cys	Thr	Tyr	Val	Leu	Gly	Ile	Ser	Glu	Glu	Tyr	Leu	
			20					25						30		

aag gaa agg ccc caa ggt tta aat gtt gag act aat aat aat aat aat	144
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aaa aaa gtg aag ata ata tct aga cct gtt gag aat aca tta cat aga	288
Lys Lys Val Lys Ile Ile Ser Arg Pro Val Glu Asn Thr Leu His Arg	
85 90 95	
tat cca gtt agt tct ttt ctg aat atc aaa aag tat ggt agg aaa ggg	336
Tyr Pro Val Ser Ser Phe Leu Asn Ile Lys Lys Tyr Gly Arg Lys Gly	
100 105 110	
gaa tat ttg aat aga aat agt ttt gtt caa aga tca tat ata agg ggt	384
Glu Tyr Leu Asn Arg Asn Ser Phe Val Gln Arg Ser Tyr Ile Arg Gly	
115 120 125	
tgt aaa gga aaa aga agc aca cat aca tgg ata tgt gaa aat aaa ggg	432
Cys Lys Gly Lys Arg Ser Thr His Thr Trp Ile Cys Glu Asn Lys Gly	
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Asn Asn Asn Ile Cys Ile Pro Asp Arg Arg Val Gln Leu Cys Ile Thr	
145 150 155 160	
gct ctt caa gat tta aaa aat tca gga tct gaa acg act gat aga aaa	528
Ala Leu Gln Asp Leu Lys Asn Ser Gly Ser Glu Thr Thr Asp Arg Lys	
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Leu Leu Arg Asp Lys Val Phe Asp Ser Ala Met Tyr Glu Thr Asp Leu	
180 185 190	
tta tgg aat aaa tat ggt ttt cgt gga ttt gat gat ttt tgt gac gat	624
Leu Trp Asn Lys Tyr Gly Phe Arg Gly Phe Asp Asp Phe Cys Asp Asp	
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gta aaa aat agt tat tta gat tat aaa gat gtt ata ttt gga acc gat	672
Val Lys Asn Ser Tyr Leu Asp Tyr Lys Asp Val Ile Phe Gly Thr Asp	
210 215 220	
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225 230 235 240	
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Phe Phe Lys Lys Asp Ser Ser Val Leu Asn Pro Thr Ala Trp Trp Arg	
245 250 255	
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Arg Tyr Gly Thr Arg Leu Trp Lys Thr Met Ile Gln Pro Tyr Ala His	
260 265 270	
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Leu Gly Cys Arg Lys Pro Asp Glu Asn Glu Pro Gln Ile Asn Arg Trp	
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Ile Leu Glu Trp Gly Lys Tyr Asn Cys Arg Leu Met Lys Glu Lys Glu	
290 295 300	
aaa ttg tta aca gga gaa tgt tct gtt aat aga aaa aaa tct gac tgc	960
Lys Leu Leu Thr Gly Glu Cys Ser Val Asn Arg Lys Lys Ser Asp Cys	
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Ser Thr Gly Cys Asn Asn Glu Cys Tyr Thr Tyr Arg Ser Leu Ile Asn	
325 330 335	
aga caa aga tat gag gtc tct ata tta gga aaa aaa tat att aaa gta	1056
Arg Gln Arg Tyr Glu Val Ser Ile Leu Gly Lys Lys Tyr Ile Lys Val	
340 345 350	
gta cga tat act ata ttt agg aga aaa ata gtt caa cct gat aat gct	1104
Val Arg Tyr Thr Ile Phe Arg Arg Lys Ile Val Gln Pro Asp Asn Ala	
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ttg gat ttt tta aaa tta aat tgt tct gag tgt aag gat att gat ttt	1152
Leu Asp Phe Leu Lys Leu Asn Cys Ser Glu Cys Lys Asp Ile Asp Phe	
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Lys Pro Phe Phe Glu Phe Glu Tyr Gly Lys Tyr Glu Glu Lys Cys Met	
385 390 395 400	
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Cys Gln Ser Tyr Ile Asp Leu Lys Ile Gln Phe Lys Asn Asn Asp Ile	
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Cys Ser Phe Asn Ala Gln Thr Asp Thr Val Ser Ser Asp Lys Arg Phe	
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Cys Leu Glu Lys Lys Glu Phe Lys Pro Trp Lys Cys Asp Lys Asn Ser	
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Phe Glu Thr Val His His Lys Gly Val Cys Val Ser Pro Arg Arg Gln	
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Gly Phe Cys Leu Gly Asn Leu Asn Tyr Leu Leu Asn Asp Asp Ile Tyr	
465 470 475 480	
aat gta cat aat tca caa cta ctt atc gaa att ata atg gct tct aaa	1488
Asn Val His Asn Ser Gln Leu Leu Ile Glu Ile Ile Met Ala Ser Lys	

485										490					495					
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Gln	Glu	Gly	Lys	Leu	Leu	Trp	Lys	Lys	His	Gly	Thr	Ile	Leu	Asp	Asn					
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Gln	Asn	Asn	Leu	Asn	Leu	Ile	Phe	Glu	Arg	Asn	Phe	Gly	Tyr	Lys	Val					
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Gly	Arg	Asn	Lys	Leu	Phe	Lys	Thr	Ile	Lys	Glu	Leu	Lys	Asn	Val	Trp					
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Thr	Gly	Asn	Asn	Gly	Lys	Ser	Leu	Cys	Gln	Asp	Lys	Thr	Cys	Gln	Asn					
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705					710					715					720					

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aac aaa gaa atg tta tct ata gac tca aat agt gaa gat gcg aca gat Asn Lys Glu Met Leu Ser Ile Asp Ser Asn Ser Glu Asp Ala Thr Asp 740 745 750	2256
ata agt gag aaa aat gga gag gaa gaa tta tat gta aat cac aat tct Ile Ser Glu Lys Asn Gly Glu Glu Glu Leu Tyr Val Asn His Asn Ser 755 760 765	2304
gtg agt gtc gca agt ggt aat aaa gaa atc gaa aag agt aag gat gaa Val Ser Val Ala Ser Gly Asn Lys Glu Ile Glu Lys Ser Lys Asp Glu 770 775 780	2352
aag caa cct gaa aaa gaa gca aaa caa act aat gga act tta acc gta Lys Gln Pro Glu Lys Glu Ala Lys Gln Thr Asn Gly Thr Leu Thr Val 785 790 795 800	2400
cga act gac aaa gat tca gat aga aac aaa gga aaa gat aca gct act Arg Thr Asp Lys Asp Ser Asp Arg Asn Lys Gly Lys Asp Thr Ala Thr 805 810 815	2448
gat aca aaa aat tca cct gaa aat tta aaa gta cag gaa cat gga aca Asp Thr Lys Asn Ser Pro Glu Asn Leu Lys Val Gln Glu His Gly Thr 820 825 830	2496
aat gga gaa aca ata aaa gaa gaa cca cca aaa tta cct gaa tca tct Asn Gly Glu Thr Ile Lys Glu Glu Pro Pro Lys Leu Pro Glu Ser Ser 835 840 845	2544
gaa aca tta caa tca caa gaa caa tta gaa gca gaa gca caa aaa caa Glu Thr Leu Gln Ser Gln Glu Gln Leu Glu Ala Glu Ala Gln Lys Gln 850 855 860	2592
aaa caa gaa gaa gaa cca aaa aaa aaa caa gaa gaa gaa cca aaa aaa Lys Gln Glu Glu Glu Pro Lys Lys Lys Gln Glu Glu Glu Pro Lys Lys 865 870 875 880	2640
aaa caa gaa gaa gaa caa aaa cga gaa caa gaa caa aaa caa gaa caa Lys Gln Glu Glu Glu Gln Lys Arg Glu Gln Glu Gln Lys Gln Glu Gln 885 890 895	2688
gaa gaa gaa gaa caa aaa caa gaa gaa gaa caa caa ata caa gat caa Glu Glu Glu Glu Gln Lys Gln Glu Glu Glu Gln Gln Ile Gln Asp Gln 900 905 910	2736
tca caa agt gga tta gat caa tcc tca aaa gta gga gta gcg agt gaa Ser Gln Ser Gly Leu Asp Gln Ser Ser Lys Val Gly Val Ala Ser Glu 915 920 925	2784
caa aat gaa att tct tca gga caa gaa caa aac gta aaa agc tct tca Gln Asn Glu Ile Ser Ser Gly Gln Glu Gln Asn Val Lys Ser Ser Ser 930 935 940	2832

cct gaa gta gtt cca caa gaa aca act agt gaa aat ggg tca tca caa Pro Glu Val Val Pro Gln Glu Thr Thr Ser Glu Asn Gly Ser Ser Gln 945 950 955 960	2880
gac aca aaa ata tca agt act gaa cca aat gag aat tct gtt gta gat Asp Thr Lys Ile Ser Ser Thr Glu Pro Asn Glu Asn Ser Val Val Asp 965 970 975	2928
aga gca aca gat agt atg aat tta gat cct gaa aag gtt cat aat gaa Arg Ala Thr Asp Ser Met Asn Leu Asp Pro Glu Lys Val His Asn Glu 980 985 990	2976
aat atg agt gat cca aat aca aat act gaa cca gat gca tct tta aaa Asn Met Ser Asp Pro Asn Thr Asn Thr Glu Pro Asp Ala Ser Leu Lys 995 1000 1005	3024
gat gat aag aag gaa gtt gat gat gcc aaa aaa gaa ctt caa tct Asp Asp Lys Lys Glu Val Asp Asp Ala Lys Lys Glu Leu Gln Ser 1010 1015 1020	3069
act gta tca aga att gaa tct aat gaa cag gac gtt caa agt aca Thr Val Ser Arg Ile Glu Ser Asn Glu Gln Asp Val Gln Ser Thr 1025 1030 1035	3114
cca ccc gaa gat act cct act gtt gaa gga aaa gta gga gat aaa Pro Pro Glu Asp Thr Pro Thr Val Glu Gly Lys Val Gly Asp Lys 1040 1045 1050	3159
gca gaa atg tta act tct ccg cat gcg aca gat aat tct gag tcg Ala Glu Met Leu Thr Ser Pro His Ala Thr Asp Asn Ser Glu Ser 1055 1060 1065	3204
gaa tca ggt tta aat cca act gat gac att aaa aca act gat ggt Glu Ser Gly Leu Asn Pro Thr Asp Asp Ile Lys Thr Thr Asp Gly 1070 1075 1080	3249
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tct cat gaa ata tct gaa cct gtt ctt tct ggt aca act ggt aaa Ser His Glu Ile Ser Glu Pro Val Leu Ser Gly Thr Thr Gly Lys 1115 1120 1125	3384
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	1175					1180					1185				
tct	gaa	act	gaa	gtt	gta	agt	gaa	cct	gag	gat	tca	agt	agg	ata	3609
Ser	Glu	Thr	Glu	Val	Val	Ser	Glu	Pro	Glu	Asp	Ser	Ser	Arg	Ile	
	1190					1195					1200				
atg	act	aca	gaa	gtt	cca	agt	act	act	gta	aaa	ccc	cct	gat	gaa	3654
Met	Thr	Thr	Glu	Val	Pro	Ser	Thr	Thr	Val	Lys	Pro	Pro	Asp	Glu	
	1205					1210					1215				
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Lys	Arg	Ser	Glu	Glu	Val	Gly	Glu	Lys	Glu	Ala	Lys	Glu	Ile	Lys	
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Ser	Val	Ser	Val	Gln	Ser	Pro	Pro	Asn	Val	Glu	Asp	Val	Glu	Lys	
	1250					1255					1260				
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Glu	Thr	Leu	Ile	Ser	Glu	Asn	Asn	Gly	Leu	His	Asn	Asp	Thr	His	
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Arg	Gly	Asn	Ile	Ser	Glu	Lys	Asp	Leu	Ile	Asp	Ile	His	Leu	Leu	
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Arg	Asn	Glu	Ala	Gly	Ser	Thr	Ile	Leu	Asp	Asp	Ser	Arg	Arg	Asn	
	1295					1300					1305				
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Gly	Glu	Met	Thr	Glu	Gly	Ser	Glu	Ser	Asp	Val	Gly	Glu	Leu	Gln	
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gaa	cat	aat	ttt	agc	aca	caa	caa	aaa	gat	gaa	aaa	gat	ttt	gac	4014
Glu	His	Asn	Phe	Ser	Thr	Gln	Gln	Lys	Asp	Glu	Lys	Asp	Phe	Asp	
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caa	att	gcg	agc	gat	aga	gaa	aaa	gaa	gaa	att	caa	aaa	tta	ctt	4059
Gln	Ile	Ala	Ser	Asp	Arg	Glu	Lys	Glu	Glu	Ile	Gln	Lys	Leu	Leu	
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Asn	Ile	Gly	His	Glu	Glu	Asp	Glu	Asp	Val	Leu	Lys	Met	Asp	Arg	
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aca	gag	gat	agt	atg	agt	gat	gga	gtt	aat	agt	cat	ttg	tat	tat	4149
Thr	Glu	Asp	Ser	Met	Ser	Asp	Gly	Val	Asn	Ser	His	Leu	Tyr	Tyr	



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Asn Asn Leu Ser Ser Glu Glu	Lys Met Glu Gln Tyr	Asn Asn Arg	
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Asp Ala Ser Lys Asp Arg Glu	Glu Ile Leu Asn Arg	Ser Asn Thr	
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aat aca tgt tct aat gaa cat	tca tta aaa tat tgt	caa tat atg	4284
Asn Thr Cys Ser Asn Glu His	Ser Leu Lys Tyr Cys	Gln Tyr Met	
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Glu Arg Asn Lys Asp Leu Leu	Glu Thr Cys Ser Glu	Asp Lys Arg	
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tta cat tta tgt tgt gaa ata	tca gat tat tgt tta	aaa ttt ttc	4374
Leu His Leu Cys Cys Glu Ile	Ser Asp Tyr Cys Leu	Lys Phe Phe	
1445	1450	1455	
aat cct aaa tcg ata gaa tac	ttt gat tgt aca caa	aaa gaa ttt	4419
Asn Pro Lys Ser Ile Glu Tyr	Phe Asp Cys Thr Gln	Lys Glu Phe	
1460	1465	1470	
gat gac cct aca tat aat tgt	ttt aga aaa caa aga	ttt aca agt	4464
Asp Asp Pro Thr Tyr Asn Cys	Phe Arg Lys Gln Arg	Phe Thr Ser	
1475	1480	1485	
atgtcatgtt ataaaattaa aaacaatata	cattaatatg ttaataaaaa	aaataatata	4524
ttttttttctc tttttctttt tttttaatag	gt atg cat tat att gcc ggg ggt		4577
	Met His Tyr Ile Ala Gly Gly		
	1490	1495	
ggg ata ata gcc ctt tta ttg ttt att tta	ggg tca gcc agc tat		4622
Gly Ile Ile Ala Leu Leu Leu Phe Ile Leu	Gly Ser Ala Ser Tyr		
1500	1505	1510	
agg aag aat ttg taagaaaaaa	aggatgaaga aatataaaca	aaaatataaa	4674
Arg Lys Asn Leu			
tatatgcata tatatttaag tattataaga	acatatatat aaataaatat	gtatatTTTT	4734
atTTTatttat tatagg gat gat gaa aaa gga ttc	tac gat tct aat tta		4783
Asp Asp Glu Lys Gly Phe Tyr Asp Ser Asn Leu			
1515	1520	1525	
aat gat tct gct ttt gaa tat aat aat aat	aaa tat aat aaa tta		4828
Asn Asp Ser Ala Phe Glu Tyr Asn Asn Asn	Lys Tyr Asn Lys Leu		
1530	1535	1540	
cct tat atg tgtaaggaaa aaactaaaaa	acaaaaaaaa aaaaaaatat		4877
Pro Tyr Met			

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aatttttatt atttatttat ttattttttt ttttc gta gtt gat caa caa ata 4990  
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Lys Glu Arg Pro Gln Gly Leu Asn Val Glu Thr Asn Asn Asn Asn Asn  
35 40 45

Asn Asn Asn Asn Asn Asn Ser Asn Ser Asn Asp Ala Met Ser Phe Val  
50 55 60

Asn Glu Val Ile Arg Phe Ile Glu Asn Glu Lys Asp Asp Lys Glu Asp  
65 70 75 80

Lys Lys Val Lys Ile Ile Ser Arg Pro Val Glu Asn Thr Leu His Arg  
85 90 95

Tyr Pro Val Ser Ser Phe Leu Asn Ile Lys Lys Tyr Gly Arg Lys Gly  
100 105 110

Glu Tyr Leu Asn Arg Asn Ser Phe Val Gln Arg Ser Tyr Ile Arg Gly

115

120

125

Cys Lys Gly Lys Arg Ser Thr His Thr Trp Ile Cys Glu Asn Lys Gly  
130 135 140

Asn Asn Asn Ile Cys Ile Pro Asp Arg Arg Val Gln Leu Cys Ile Thr  
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Ala Leu Gln Asp Leu Lys Asn Ser Gly Ser Glu Thr Thr Asp Arg Lys  
165 170 175

Leu Leu Arg Asp Lys Val Phe Asp Ser Ala Met Tyr Glu Thr Asp Leu  
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Leu Trp Asn Lys Tyr Gly Phe Arg Gly Phe Asp Asp Phe Cys Asp Asp  
195 200 205

Val Lys Asn Ser Tyr Leu Asp Tyr Lys Asp Val Ile Phe Gly Thr Asp  
210 215 220

Leu Asp Lys Asn Asn Ile Ser Lys Leu Val Glu Glu Ser Leu Lys Arg  
225 230 235 240

Phe Phe Lys Lys Asp Ser Ser Val Leu Asn Pro Thr Ala Trp Trp Arg  
245 250 255

Arg Tyr Gly Thr Arg Leu Trp Lys Thr Met Ile Gln Pro Tyr Ala His  
260 265 270

Leu Gly Cys Arg Lys Pro Asp Glu Asn Glu Pro Gln Ile Asn Arg Trp  
275 280 285

Ile Leu Glu Trp Gly Lys Tyr Asn Cys Arg Leu Met Lys Glu Lys Glu  
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Lys Leu Leu Thr Gly Glu Cys Ser Val Asn Arg Lys Lys Ser Asp Cys  
305 310 315 320

Ser Thr Gly Cys Asn Asn Glu Cys Tyr Thr Tyr Arg Ser Leu Ile Asn  
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Arg Gln Arg Tyr Glu Val Ser Ile Leu Gly Lys Lys Tyr Ile Lys Val  
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Val Arg Tyr Thr Ile Phe Arg Arg Lys Ile Val Gln Pro Asp Asn Ala  
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Leu Asp Phe Leu Lys Leu Asn Cys Ser Glu Cys Lys Asp Ile Asp Phe  
370 375 380

Lys Pro Phe Phe Glu Phe Glu Tyr Gly Lys Tyr Glu Glu Lys Cys Met  
385 390 395 400

Cys Gln Ser Tyr Ile Asp Leu Lys Ile Gln Phe Lys Asn Asn Asp Ile  
405 410 415

Cys Ser Phe Asn Ala Gln Thr Asp Thr Val Ser Ser Asp Lys Arg Phe  
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Cys Leu Glu Lys Lys Glu Phe Lys Pro Trp Lys Cys Asp Lys Asn Ser  
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Phe Glu Thr Val His His Lys Gly Val Cys Val Ser Pro Arg Arg Gln  
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Gly Phe Cys Leu Gly Asn Leu Asn Tyr Leu Leu Asn Asp Asp Ile Tyr  
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Asn Val His Asn Ser Gln Leu Leu Ile Glu Ile Ile Met Ala Ser Lys  
485 490 495

Gln Glu Gly Lys Leu Leu Trp Lys Lys His Gly Thr Ile Leu Asp Asn  
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Gln Asn Ala Cys Lys Tyr Ile Asn Asp Ser Tyr Val Asp Tyr Lys Asp  
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Ile Val Ile Gly Asn Asp Leu Trp Asn Asp Asn Asn Ser Ile Lys Val  
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Gln Asn Asn Leu Asn Leu Ile Phe Glu Arg Asn Phe Gly Tyr Lys Val  
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Gly Arg Asn Lys Leu Phe Lys Thr Ile Lys Glu Leu Lys Asn Val Trp  
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Trp Ile Leu Asn Arg Asn Lys Val Trp Glu Ser Met Arg Cys Gly Ile  
580 585 590

Asp Glu Val Asp Gln Arg Arg Lys Thr Cys Glu Arg Ile Asp Glu Leu  
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Glu Asn Met Pro Gln Phe Phe Arg Trp Phe Ser Gln Trp Ala His Phe  
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Phe Cys Lys Glu Lys Glu Tyr Trp Glu Leu Lys Leu Asn Asp Lys Cys  
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Thr Gly Asn Asn Gly Lys Ser Leu Cys Gln Asp Lys Thr Cys Gln Asn  
645 650 655

Val Cys Thr Asn Met Asn Tyr Trp Thr Tyr Thr Arg Lys Leu Ala Tyr  
660 665 670

Glu Ile Gln Ser Val Lys Tyr Asp Lys Asp Arg Lys Leu Phe Ser Leu  
675 680 685

Ala Lys Asp Lys Asn Val Thr Thr Phe Leu Lys Glu Asn Ala Lys Asn  
690 695 700

Cys Ser Asn Ile Asp Phe Thr Lys Ile Phe Asp Gln Leu Asp Lys Leu  
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Phe Lys Glu Arg Cys Ser Cys Met Asp Thr Gln Val Leu Glu Val Lys  
725 730 735

Asn Lys Glu Met Leu Ser Ile Asp Ser Asn Ser Glu Asp Ala Thr Asp  
740 745 750

Ile Ser Glu Lys Asn Gly Glu Glu Glu Leu Tyr Val Asn His Asn Ser  
755 760 765

Val Ser Val Ala Ser Gly Asn Lys Glu Ile Glu Lys Ser Lys Asp Glu  
770 775 780

Lys Gln Pro Glu Lys Glu Ala Lys Gln Thr Asn Gly Thr Leu Thr Val  
785 790 795 800

Arg Thr Asp Lys Asp Ser Asp Arg Asn Lys Gly Lys Asp Thr Ala Thr  
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Asp Thr Lys Asn Ser Pro Glu Asn Leu Lys Val Gln Glu His Gly Thr  
820 825 830

Asn Gly Glu Thr Ile Lys Glu Glu Pro Pro Lys Leu Pro Glu Ser Ser  
835 840 845

Glu Thr Leu Gln Ser Gln Glu Gln Leu Glu Ala Glu Ala Gln Lys Gln  
850 855 860

Lys Gln Glu Glu Glu Pro Lys Lys Lys Gln Glu Glu Glu Pro Lys Lys  
865 870 875 880

Lys Gln Glu Glu Glu Gln Lys Arg Glu Gln Glu Gln Lys Gln Glu Gln  
885 890 895

Glu Glu Glu Glu Gln Lys Gln Glu Glu Glu Gln Gln Ile Gln Asp Gln  
900 905 910

Ser Gln Ser Gly Leu Asp Gln Ser Ser Lys Val Gly Val Ala Ser Glu  
915 920 925

Gln Asn Glu Ile Ser Ser Gly Gln Glu Gln Asn Val Lys Ser Ser Ser  
930 935 940

Pro Glu Val Val Pro Gln Glu Thr Thr Ser Glu Asn Gly Ser Ser Gln  
945 950 955 960

Asp Thr Lys Ile Ser Ser Thr Glu Pro Asn Glu Asn Ser Val Val Asp  
965 970 975

Arg Ala Thr Asp Ser Met Asn Leu Asp Pro Glu Lys Val His Asn Glu  
980 985 990

Asn Met Ser Asp Pro Asn Thr Asn Thr Glu Pro Asp Ala Ser Leu Lys  
995 1000 1005

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Thr Val Ser Arg Ile Glu Ser Asn Glu Gln Asp Val Gln Ser Thr

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Pro Pro Glu Asp Thr Pro Thr Val Glu Gly Lys Val Gly Asp Lys				
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Ala Glu Met Leu Thr Ser Pro His Ala Thr Asp Asn Ser Glu Ser				
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Glu Ser Gly Leu Asn Pro Thr Asp Asp Ile Lys Thr Thr Asp Gly				
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Val Val Lys Glu Gln Glu Ile Leu Gly Gly Gly Glu Ser Ala Thr				
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Glu Thr Ser Lys Ser Asn Leu Glu Lys Pro Lys Asp Val Glu Pro				
1100		1105		1110
Ser His Glu Ile Ser Glu Pro Val Leu Ser Gly Thr Thr Gly Lys				
1115		1120		1125
Glu Glu Ser Glu Leu Leu Lys Ser Lys Ser Ile Glu Thr Lys Gly				
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Glu Thr Asp Pro Arg Ser Asn Asp Gln Glu Asp Ala Thr Asp Asp				
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Val Val Glu Asn Ser Arg Asp Asp Asn Asn Ser Leu Ser Asn Ser				
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Val Asp Asn Gln Ser Asn Val Leu Asn Arg Glu Asp Pro Ile Ala				
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Ser Glu Thr Glu Val Val Ser Glu Pro Glu Asp Ser Ser Arg Ile				
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Met Thr Thr Glu Val Pro Ser Thr Thr Val Lys Pro Pro Asp Glu				
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Lys Arg Ser Glu Glu Val Gly Glu Lys Glu Ala Lys Glu Ile Lys				
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Val Glu Pro Val Val Pro Arg Ala Ile Gly Glu Pro Met Glu Asn				
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Thr Glu Asp Ser Met Ser Asp Gly Val Asn Ser His Leu Tyr Tyr  
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Glu Arg Asn Lys Asp Leu Leu Glu Thr Cys Ser Glu Asp Lys Arg  
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Leu His Leu Cys Cys Glu Ile Ser Asp Tyr Cys Leu Lys Phe Phe  
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Asp Asp Pro Thr Tyr Asn Cys Phe Arg Lys Gln Arg Phe Thr Ser  
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